REMARKS

Amendments

The abstract has been replaced in order to address the Examiner's objection to the originally presented abstract. Headings have been added to the specification, and, to address the Examiner's objection to the lack of a brief description of the drawings, a brief description has, thus, been added to the specification.

Independent claim 1 is amended to more clearly define the claimed process. The amendments provide for a feed gas composition (i.e., first gas stream) to have a defined composition that includes sulfur dioxide, hydrogen cyanide, and hydrogen sulfide. Further amendments to claim 1 include inserting language that express the type of reactions that occur in the hydrogenation and hydrolysis steps and certain of the components that are yielded with the product gas streams from these steps. Other amendments to claim 1 address certain clarity issues.

The amendments to dependent claims 3-6 and 9 a principally to address clarity issues.

The new claims 11 - 19 claim other embodiments of the inventive process.

Formalities Objections

In response to the Examiner's objection to the originally submitted abstract, a new abstract has been presented as a replacement of the original. It is respectfully submitted that the replacement abstract addresses the Examiner's objection and should be acceptable.

The Examiner has also expressed an objection to the specification that it does not provide a "Brief Description of the Drawing." This has been addressed by adding a brief description. The specification also has been amended to include headings.

§112 Rejection

Claim 1 has been rejected due to certain inconsistencies between language of the claim preamble and that of step c. It is submitted that the amendments to claim 1 have resolved any inconsistencies that may have existed in the originally presented claim. The new language of claim 1 more explicitly defines the HCN removal step as including the hydrolysis reaction that yields NH_3 as a reaction product contained in the third gas stream that undergoes an NH_3 removal step.

§103 Rejection of claims 1-10 over Borsboom et al. (EP 0 324 526) in view of Buisman (US 5,976,868)

Borsboom teaches a multiple step process for converting carbonyl sulfide (COS) and/or carbon disulfide (CS_2), and possibly other compounds, that are contained in a reducing CO containing gas stream. *See, e.g.*, abstract, page 2, lines 1-3; page 3, lines 56-58; page 4, lines 53-56; Examples 1 & 2. The Borsboom process includes a first stage that uses a CO shift reaction to convert the CO by reaction with water to carbon dioxide and hydrogen. *See e.g.*, page 3, lines 1-2, 9-48; reactor 12. If O_2 or SO_2 is present in the reducing CO containing gas stream, it is either simultaneously or subsequently hydrogenated. *See e.g.*, Page 3, lines 1-2, 9-12. Following the first stage of the process is the second stage, which includes the catalytic hydrolysis of COS and/or CS_2 to hydrogen sulfide. *See e.g.*, page 3, lines 1-4, 13-15, 38-48; page 4, lines 54-58, reactor 12 (shift reactor), reactor 14 (hydrolysis reactor).

As noted by Borsboom, one of the differences of its process over those of the prior art teachings is that the Borsboom process uses an insufficient amount of water relative to the CO content of the feed so that a substantial conversion of H_2O with CO is achieved. *See* page 3, lines 23-26. This is done to control the outlet temperature of the first stage. *See* page 3, lines 24-26. Another advantage asserted by Borsboom of its process is that the incidental presence of O_2 and SO_2 in the CO containing feed stream can also be removed without separate measures. *See* page 3, lines 32-37. There is no disclosure in the Borsboom publication of an NH_3 removal step, or of an H_2S removal step that uses an aqueous alkaline washing liquid to perform the removal, or of a biological oxidation and sulfur separation step as are recited in the Applicants' claims.

The Buisman patent teaches the use of a biological process in the treatment of gases that contain hydrogen sulfide. *See e.g.*, abstract; column 1, lines 4-12; and throughout the specification. In the Buisman process, an alkaline wash liquid is used to remove hydrogen sulfide from a gas stream with the spent wash liquid being treated in an aerobic bioreactor with oxygen in the presence of sulfide oxidizing bacteria. *See e.g.*, column 1, lines 4-12; claim 1. It is asserted by Buisman that one advantage of its process is that it allows for the removal of other undesirable gaseous components such as ammonia, hydrocyanic acid, sulfur dioxide, carbon disulfide, or carbonyl sulfide to be removed without separate pretreatment or post-treatments and associated installations required for such removal. *See e.g.*, abstract and column 1, lines 27-34. There is no teaching in the Buisman patent that SO_2,COS, CS_2, NH_3 and HCN are separately removed by the use of catalytic steps or the use of aqueous acidic washing liquid. Actually, Buisman teaches that it is an advantageous aspect of its process that these

compounds may be removed without separate pretreatment or post-treatment and associated installations required for removal. *See* column 1, lines 29-34.

The Examiner notes that the primary Borsboom reference fails to teach steps d, e and f of Applicants' process of claim 1. However, the Examiner argues that the secondary reference of Buisman discloses these steps; and, because Buisman indicates that its process may additionally remove SO_2 and COS and other compounds from a gas stream, the Examiner argues that it is obvious to modify the Borsboom process to include the H_2S removal step that is disclosed in Buisman. The Examiner further argues that the Applicants' claimed ammonia removal step c, that also is not taught by Borsboom, is obvious due to the Buisman abstract mentioning that ammonia may be present as an impurity in a gas stream to be treated. The Examiner finally argues that the recycle step g of the Applicants' claimed invention is obvious due to Buisman indicating that in its process the effluent from its aerobic reactor may be recycled to its gas scrubber as wash liquid.

The Applicants respectfully submit that the Buisman reference actually teaches against its combination with the Borsboom reference as is suggested by the Examiner. Buisman indicates that one of the advantages of its process is that it also allows for the removal of other undesirable gaseous components, such as NH_3, HCN, SO_2, CS_2, or COS, without separate pretreatment or post-treatments and the associated installations. *See* Buisman at column 1, lines 27-34. This indicates that Buisman does not contemplate using its process in combination with other process steps to remove these components. There is no teaching within the references that would motivate one skilled in the art to combine teachings of the references in the manner suggested by the Examiner.

Moreover, the teachings of the primary and secondary references cannot be combined in a way that provides the Applicants' claimed invention. The NH_3 removal zone of the Applicants' process is a step provided for the removal of ammonia that is yielded as a result of the hydrolysis of HCN that occurs in the hydrolysis step of the process. There is, thus, an ammonia removal step that uses an aqueous acidic washing liquid that is followed by an hydrogen sulfide removal step that uses an aqueous alkaline washing liquid. As recited in the claims, these steps follow a particular order. The combined disclosures of the Borsboom and Buisman references fail to teach all the process steps of the Applicants' claimed process. And, furthermore, the references cannot properly be combined to present a process having all the process steps of the Applicants' claimed process in the order and arrangement as claimed.

Conclusion

In view of the above, it is submitted that the now pending claims 1-19 are patentable over the prior art and early allowance thereof is therefore respectfully requested.

Respectfully submitted,

PIERRE GRANDVALLET, ANTHONY P. HAGAN, and LAURENT G. HUVE

By /Charles W. Stewart/
Their Attorney, Charles W. Stewart
Registration No. 34,023
(713) 241-0360

P. O. Box 2463
Houston, Texas 77252-2463